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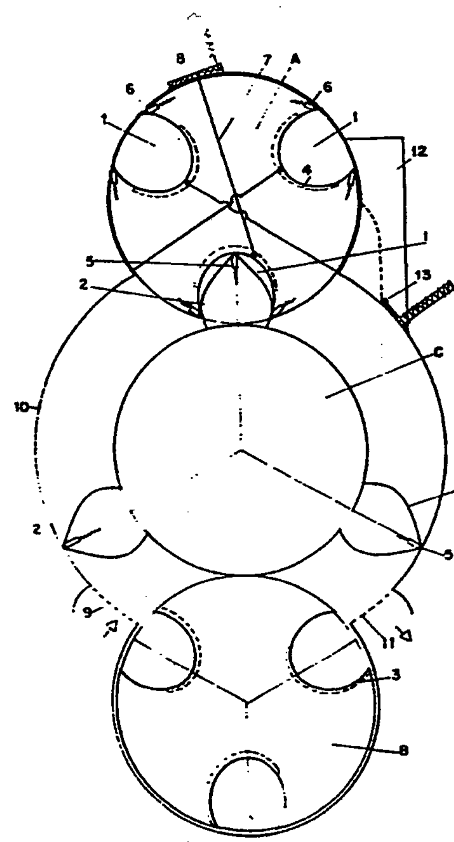
(54) Title: ROTATING INTERNAL COMBUSTION ENGINE

(57) Abstract

Rotating internal combustion engine which comprises three rotors (A, B, C), a central rotor (C) and another two (A, B), one on each side, the central rotor is cylindrical, containing on its periphery teeth (2) which fit in the respective cavities (1) provided on the surface of the rotors at each end in order to permit that the two points of the cavity (1') close to the periphery of the side rotors keep permanent contact with the surface of the respective tooth (2) in order to define its geometry.



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"ROTATING INTERNAL COMBUSTION ENGINE".

The invention is a rotating four stroke with three or more rotors engine. It consists of a new concept of a rotating four stroke, three or more rotors engine, hereinafter referred to as "Kozoubsky Engine", the purpose of which is to substitute conventional piston motors and the rotating ones of the Wenkel type, as well as previous attempts of rotating engines with blades. Therefore, it is not an improvement but a totally new approach.

As compared to conventional piston motors, it eliminates pistons, rods, crankshafts and particularly the oscillation of the piston's "come and go" motion and the consequent transformation of the rectilinear movement of the pistons into rotating movement of the crankshaft, as well as of the valves and all its connecting mechanisms and independence between the admission and combustion environments as it will be further demonstrated. The "Kozoubsky Engine" as presented performs three complete cycles by rotation, having thus in the relation weight x power, a substatial improvement in relatio even to the two stroke piston engine, but having four strokes thus being equivalent to the much desired results of the Wenkel motors. Therefore, it becomes an ideal engine for mobile uses. As we shall further see this number of cycles can vary from two up to as many as can be physically adapted in the geometry of the machine.

In relation to rotary engines of the "Wenkel" type, it eliminates the vibration caused by the eccentric movement of the rotor, as well as the difficulty to lubricate and cool the rotor, aside the problems of sealing caused by said eccentricities.

In relation to rotation engines with blade rotor, of which there are no news that they ever have been manufactured or in service, it eliminates the movements of the blades causing the loss of adherence to

the walls of the cylinder causing subsequent loss of compression.

The major characteristic defining the "Kozoubsky Engine" invention is the addition of three or more rotors, completely balanced which rotate jointly , coupled by means of external gears, being in line or not, the central rotor having two or more teeth which as they move mesh in an equal matching cavities on the external rotors and the system of ignition turning together with the rotor where the explosion occurs.

In the presentation of this patent request the three teeth and three rotors with aligned ' centers option was chosen.

Figure 1 is a schematic view illustrating the generation of the cavity in the engine of the present invention.

Figure 2 is a schematic view showing the generation of the tooth in the engine of this invention.

Figure 4 is a schematic view showing the sealing of the engine's rotating tooth system.

Figure 5 is a schematic view showing the sealing system of the cavity of the engine.

Figure 3 is a schematic view of the complete engine arrangement.

Figure 6a to 6h are illustrations showing the different stages of the engine's functioning.

The shape of cavities 1 is obtained by creating a geometric curve described by a radius of the size of the height of tooth 2 itself which extends beyond the periphery of the central cylindrical rotor C penetrating at the extremities in cylinders A and B jointly coupled through the gears (Figure 1 and 2).

The shape of teeth 2 is obtained by the penetration of one of the teeth in the cavities 1,in such a way as to keep the two points 1' of the cavity

close to the cylinder's periphery permanently in contact with the periphery of the teeth when it moves through the cavity while the rotors turn. The height of the teeth ' is exactly equal to the size of the radius which served to draw the cavity.

Thus a sort of tooth 2 (Figura 2) is obtained. The distribution of teeth 2 and of cavities 1 along the cylinder will depend on the quantity to be cho sen, dividing the circle in the corresponding number of degrees.

To keep complete synchronization between the rotors and to make them touch on each other with greater precision and possible pressure, it is imperative that the cylinders and gears be very precisely of the same fundamental size.

The rotors being centered can easily be cooled. Oil can be added to the fuel mixture or the air allowed in the case of direct injection, to improve the lubrication of the internal walls of the block and of the consequent sliding of the sealing devices.

The engine in question is composed of six essential parts as follows:

1. Block, block cover.
2. Rotors, covers of the rotors and gears.
3. Seals, sealing rings, and tooth ' and cavity springs.
4. Cooling system of the block.
5. Cooling system of the internal parts of the rotors.
6. Rotating ignition system.

The block 10 is a piece made of one or several parts depending of the manufacturing conveniences, with three cylindrical bores where the rotors will turn.

The block has furthermore holes or

windows 9 to permit the access of the combustion mixture and other holes 11 for the exhit of gases resulting from the combustion, as well as an extension channel 12 with its valve 13, the function of which will be described ahead.

The block will contain moreover the necessary device for its own cooling and the passage of high tension wires which will reach the electrodes of the combustion rotor A.

The block covers. in addition to cove ring laterally the cylinders where the rotors turn.serve as well to house the ball bearings and pressure sealing devices that force the rotor shafts to touch each other with as much pressure as possible.

All these parts can be broken down in several pieces for easy casting and machining.

The rotors are parts that can be dis- assembles and are made of curved and cylindrical parts and when set in and screwed to the rotor covers comprise a cylindrical set containing 3 cavities 1 in the case of side rotors A and B and three teeth 2 in the case of central rotor C.

The inside of the rotor being hollow advantage is taken of this space to circulate cooling oil.

The rotor covers aside from serving to tie the rotor set to its extremities, also has, in its external part, the shaft that supports those rotors on the bearings installed in the covers of the block as well as synchronizing gears. These shafts are hollow to permit the oil to circulate inside the rotors.

To permit a perfect and constant adhe rence to the walls of the block and its respective covers, as well as the teeth of the central rotor C to the surfa ce of cavities 1 of combustion rotor C in such a way as to prevent any kind of gas escape at high pressure, the-

re will be a set of seals 5, 6, distributed in accordance with the areas of high pressure as follows: three seals 5 installed at the end of each of the teeth of the central rotor C (Figure 4). Three seals 6 set in at the foot of each cavity 1 close to the cylindrical part of the combustion rotor A at the internal side of cavities (Figure 5), a set of seals (not shown) which will be installed in the block in the cylindrical part where the combustion rotor A turns in such a way as to touch the cylindrical part of this rotor preventing the escape between the gaps formed by the rotor and block in its cylindrical part. The seals will be pressed by springs ' against its friction surfaces. Teeth 2 and cavities 1 in their extensions on rotors cover parts will have on the respective covers grooves made the closest possible to the borders where there will be installed types of rings which will follow the shape of the teeth and the cavities so that they exercise pressure on the covers of the block in order to avoid escape between the rotor covers and the block covers.

In the part of the rotor covers which fits in the block covers and which is inside it, there will be installed ball bearings, circular rings that will play the role of high pressure seals.

The part of the block wall which will be in contact with hot gases, will have a double wall where the cooling fluid will circulate.

As the rotors are empty, oil can be introduced by pumping it inside through the hollow part of their respective shafts.

One of the revolutionary characteristics of the "Kozoubsky Engine" is that all combustion engines in the transition of the compression phase to the explosion is done by the inversion of movements of a piston or of a rotor. In the case of the "Kozoubsky Engine", this inversion is achieved by the gases inside the cavi-

ty 1 of the explosion rotor A when passing from one side to the other of the tooth through the communication channels 4 thus the spark should happen inside cavity 1 of explosion rotor A while the rotating parts are moving.

For this purpose, electrodes will be installed inside the communication channels 4 in order to produce the spark which high tension brings through cables 7 inside the explosion rotor A in contact with insolated elements 8 installed in the block in a proper place.

According to the drawing on Figure 6a when turning the rotors in the sense indicated in Figure 6a, the displacement of tooth 2x will provoke by increase of volume the suction through opening 9 of the fuel mixture or air as on Figure 6b until tooth 2z reaches the position previously filled by tooth 2x, limiting the quantity of the mixture in the chamber comprised between teeth 2x and 2z according to Figure 6b previously mentioned. Continuing the rotation we shall verify in Figure 6c that tooth 2z when displaced compresses all the mixture inside the cavity which corresponds to it in the combustion rotor. When rotating some more, the edge of the tooth 2z goes through the communication channels escavated inside the cavities of the explosion rotor allowing the tooth to move without dragging the mixture along, in such a way that it goes from one side of the tooth to the other as per Figure 6d which is equivalent to the dead point in piston engines. This is the point of maximum compression and where the spark occurs or the injection of oil is made, starting the combustion and as the edge of the tooth passing immediately the position of alignment with the center of the rotors when the expansion starts, there is a tendency of tooth 2z to be expelled from the cavity and to force the rotating parts to turn in the direction indicated, helped by the inertia of the movement itself as shown on Figure 6e.

Due to the shapes permitting a total sealing at the contact points, the gases expanded by the combustion continue to force the displacement of tooth 2z as shown in Figure 6f where one can observe also that the cavity of the explosion rotor starts to penetrate in the cylindrical part of the block beginning the pressure to be maintained through the extension channel 12 after the pressure succeeds to open the anti-escape valve 13. The rotating continues until tooth 2z reaches the ope - ning 11 to the outside where the exhaust starts as per Figure 6g.

It is important to observe that tooth 2y is starting another explosion which forces by its leading face the expulsion of all the burned gases to the outside as per Figure 6h. The burned gases do not succed to pass to the admission region since the separation ro- tor B makes sure that tooth 2z when passing through the cavity in that rotor leaves all the burned gases on the side of the exhaust having for that purpose cleaning channels 3 (Figure 3) which force the gases to remain on the side of the exhaust.

There is total continuity between the cycles guaranteeing minimum vibrations and continuous torque, and in the exemple three complete cycles take place during one revolution.

C L A I M S .

1. Rotating Internal Combustion Engine characterized by: three rotors (A, B, C), a central one (C) with the other two (A, B) on each side, the central rotor is a cylinder containing, in its periphery , teeth (2) which fit in the respective cavities (1) provided on the two side rotors in a way that the two points (1') of each cavity contiguous to the periphery of the combustion and separation rotors (A, B) keeps permanent contact with the surface of the respective tooth in order to define its geometry.

2. Rotating Internal Combustion Engine in accordance with Claim 1, characterized by the existence of communication channels (4) on the explosion rotor which permits the advance of the tooth without dragging the mixture.

3. Rotating Internal Combustion Engine in accordance with Claim 1, characterized by the fact that it includes cleaning channels (3) at the separation rotor (B) to force the expulsion of burned gas through the opening (11) into the outside.

4. Rotating Internal Combustion Engine in accordance with Claim 1, characterized by the fact it includes a rotating ignition system formed by wires placed in such a way as to be able to turn with the combustion rotor (A) generating a spark when high tension is brought by cable (7).

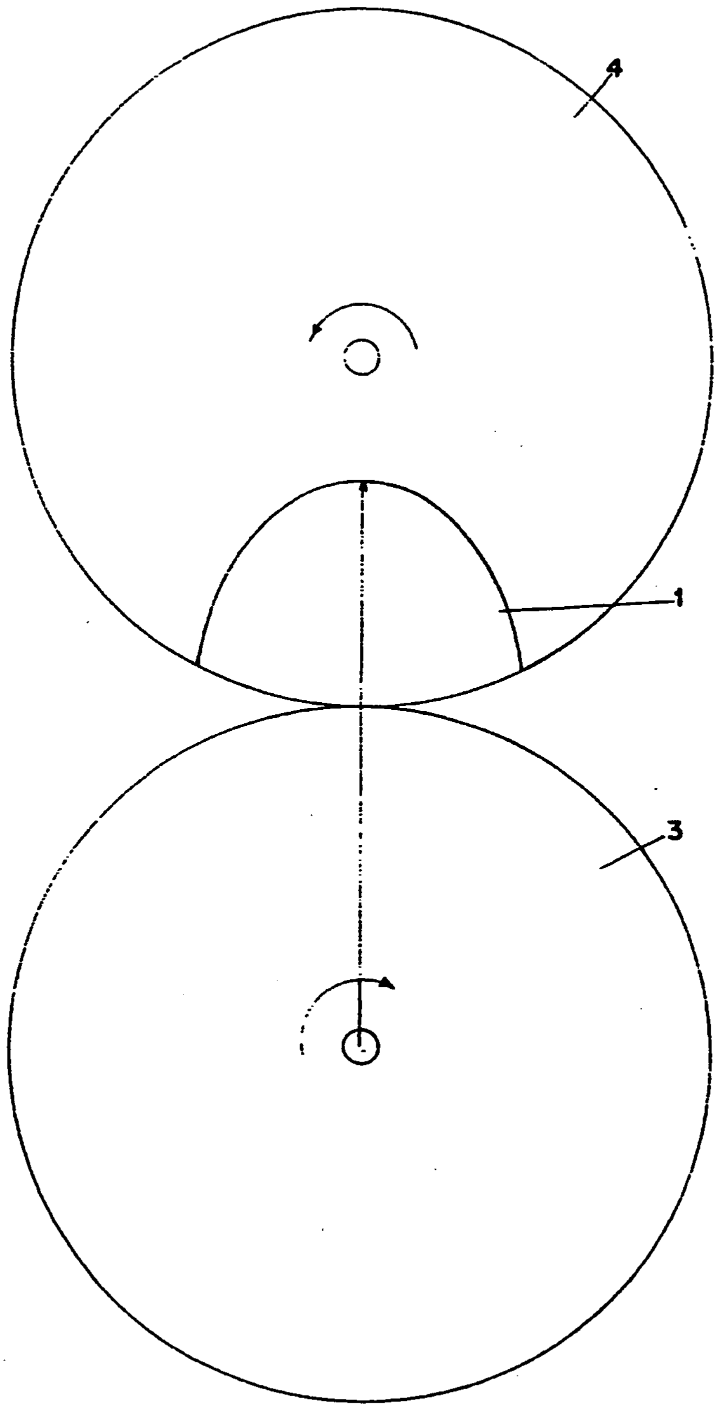

FIG. 1

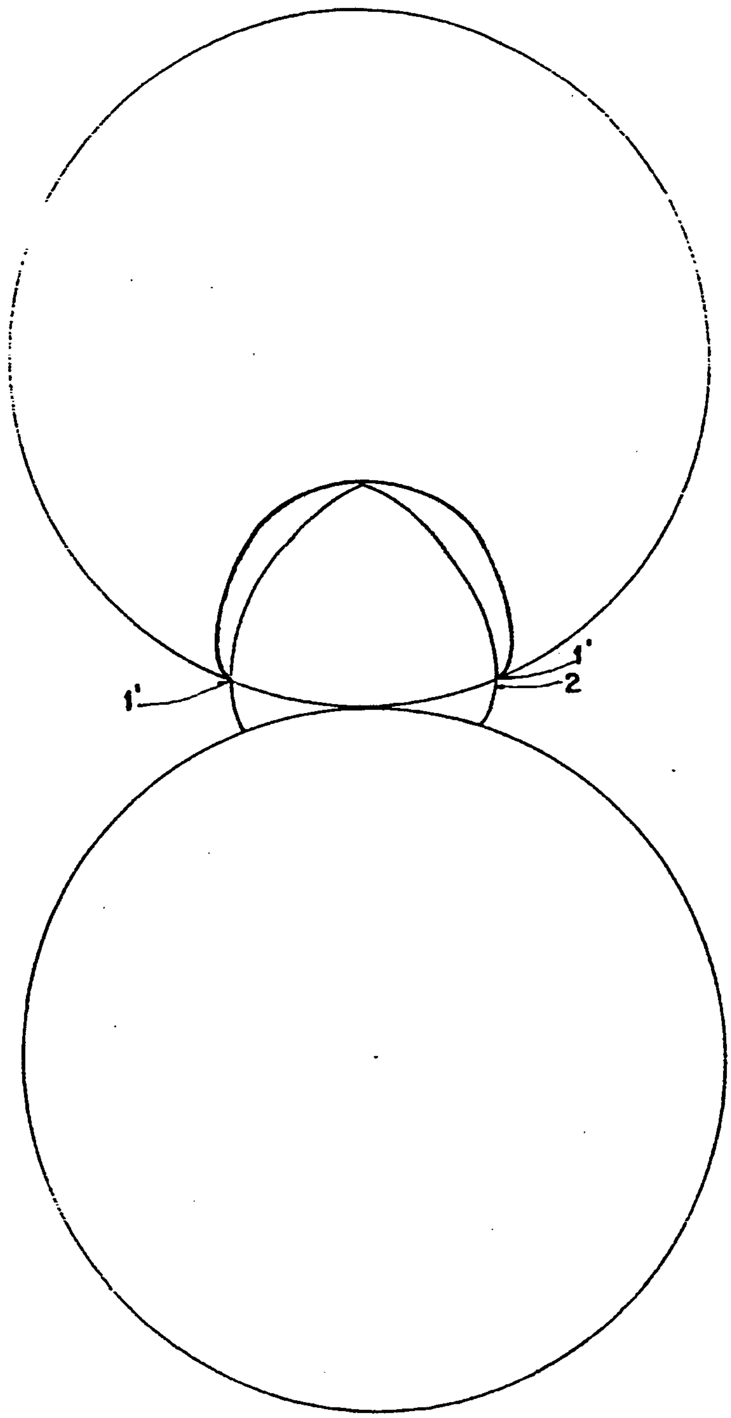

FIG. 2

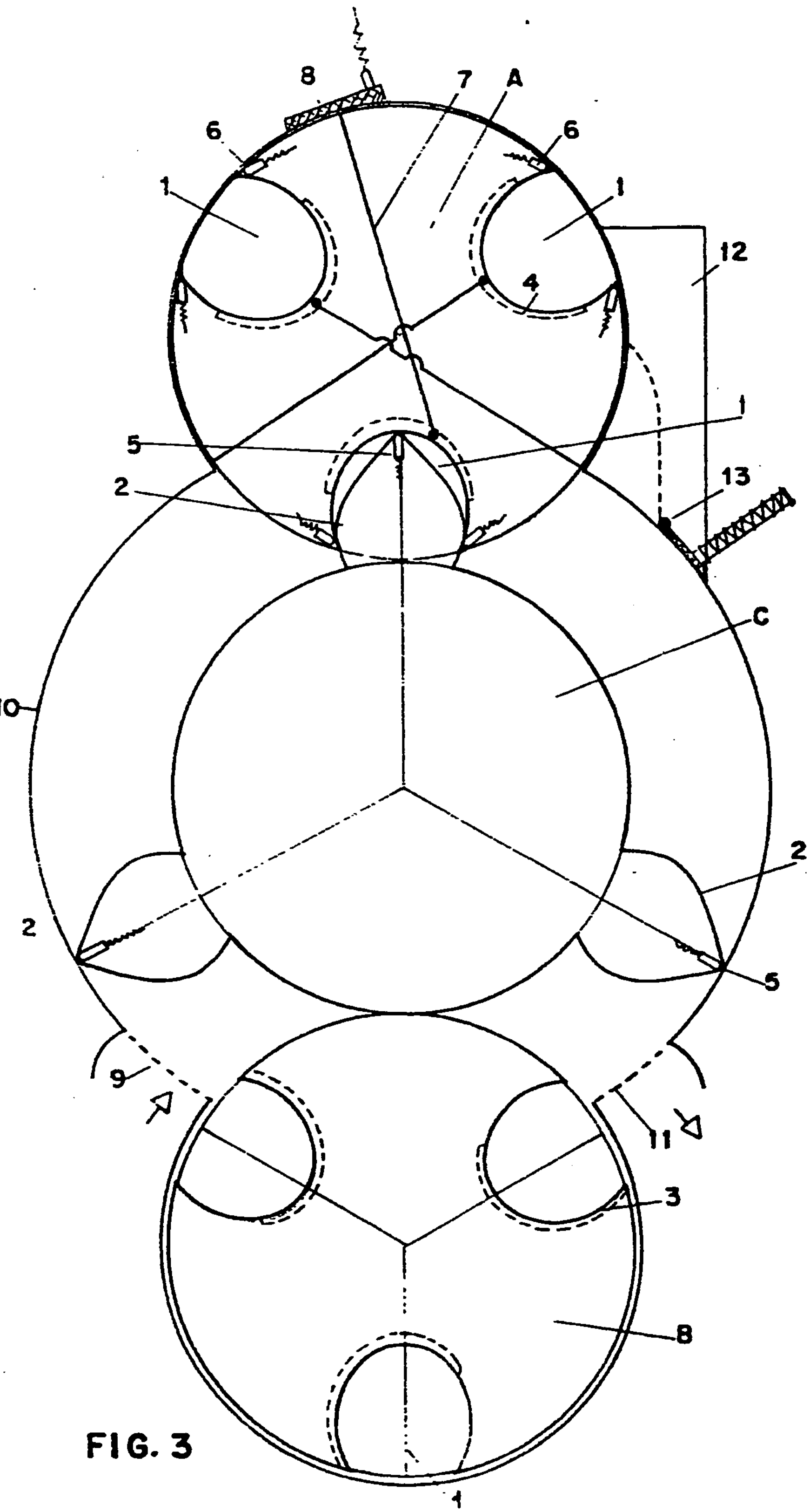

FIG. 3

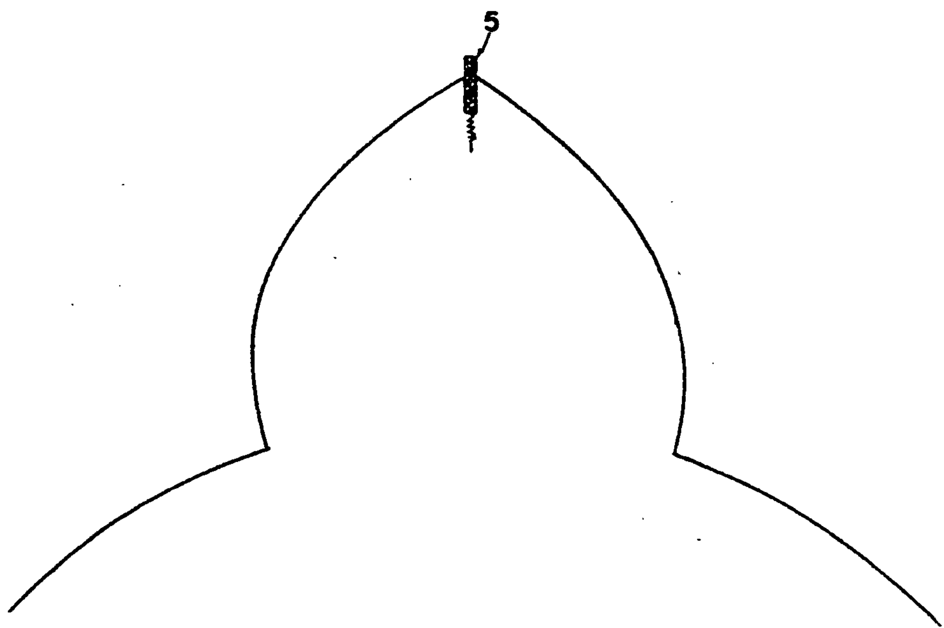

FIG. 4

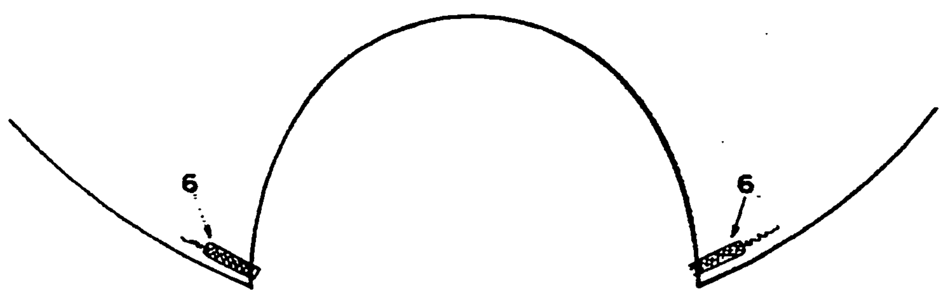

FIG. 5

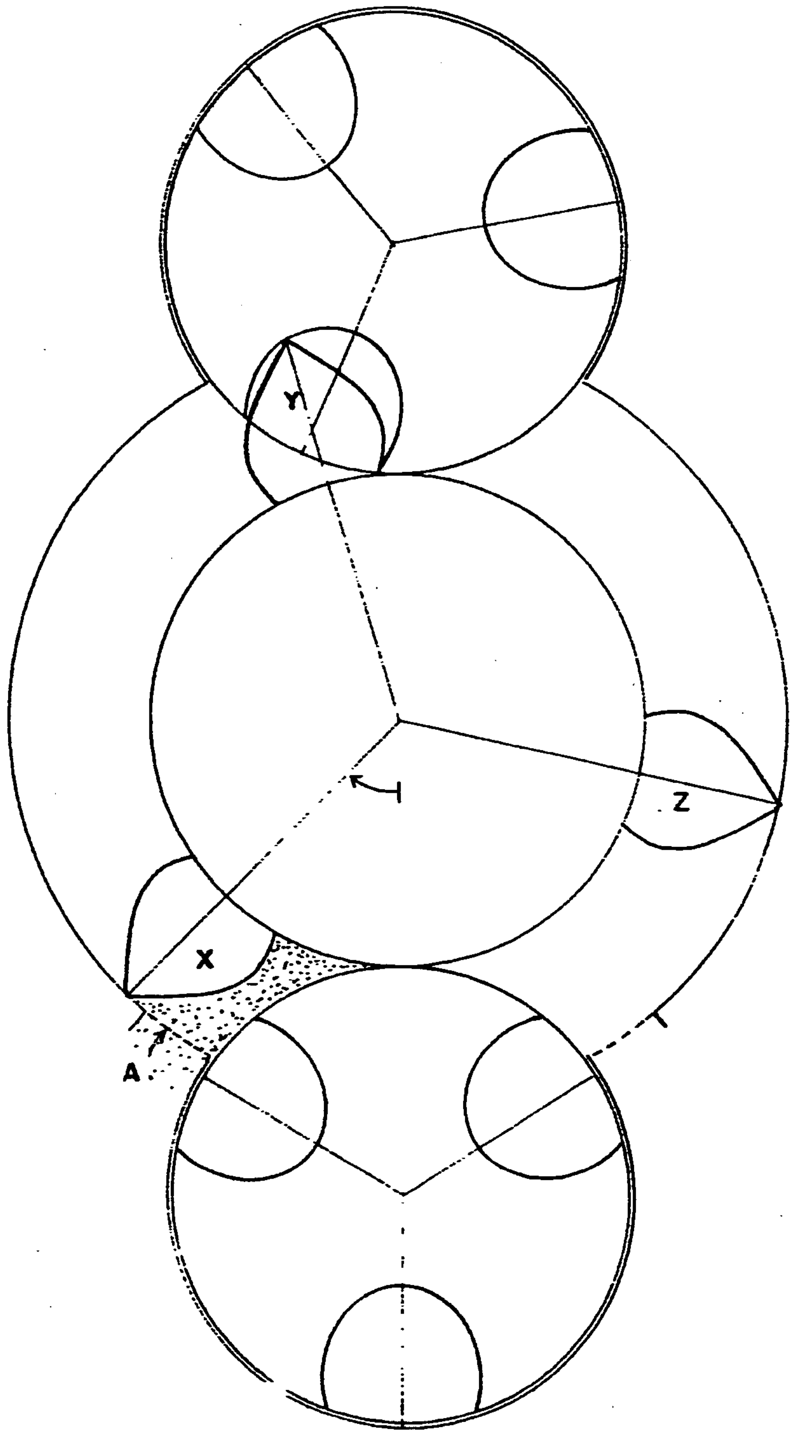

FIG. 6a

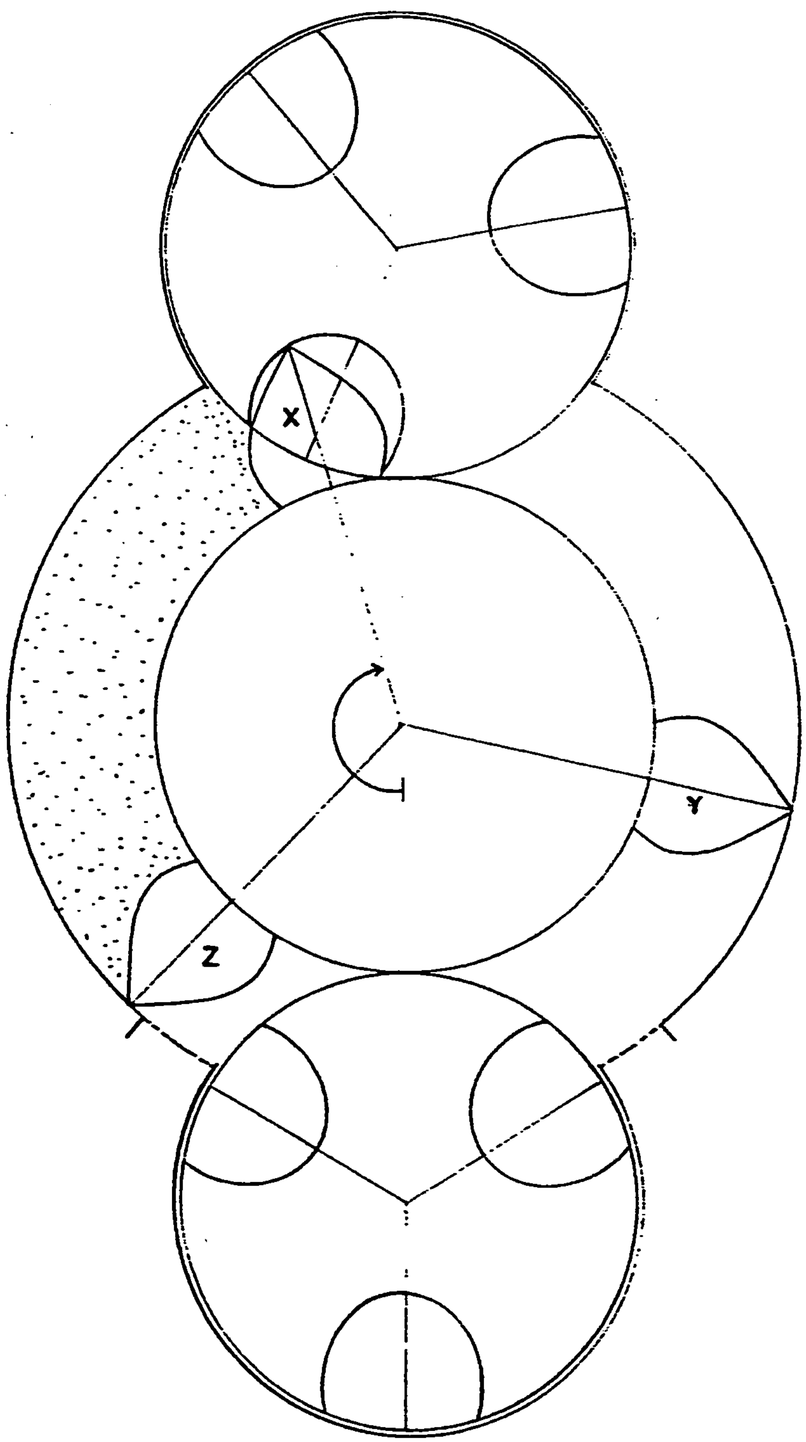

FIG. 6b

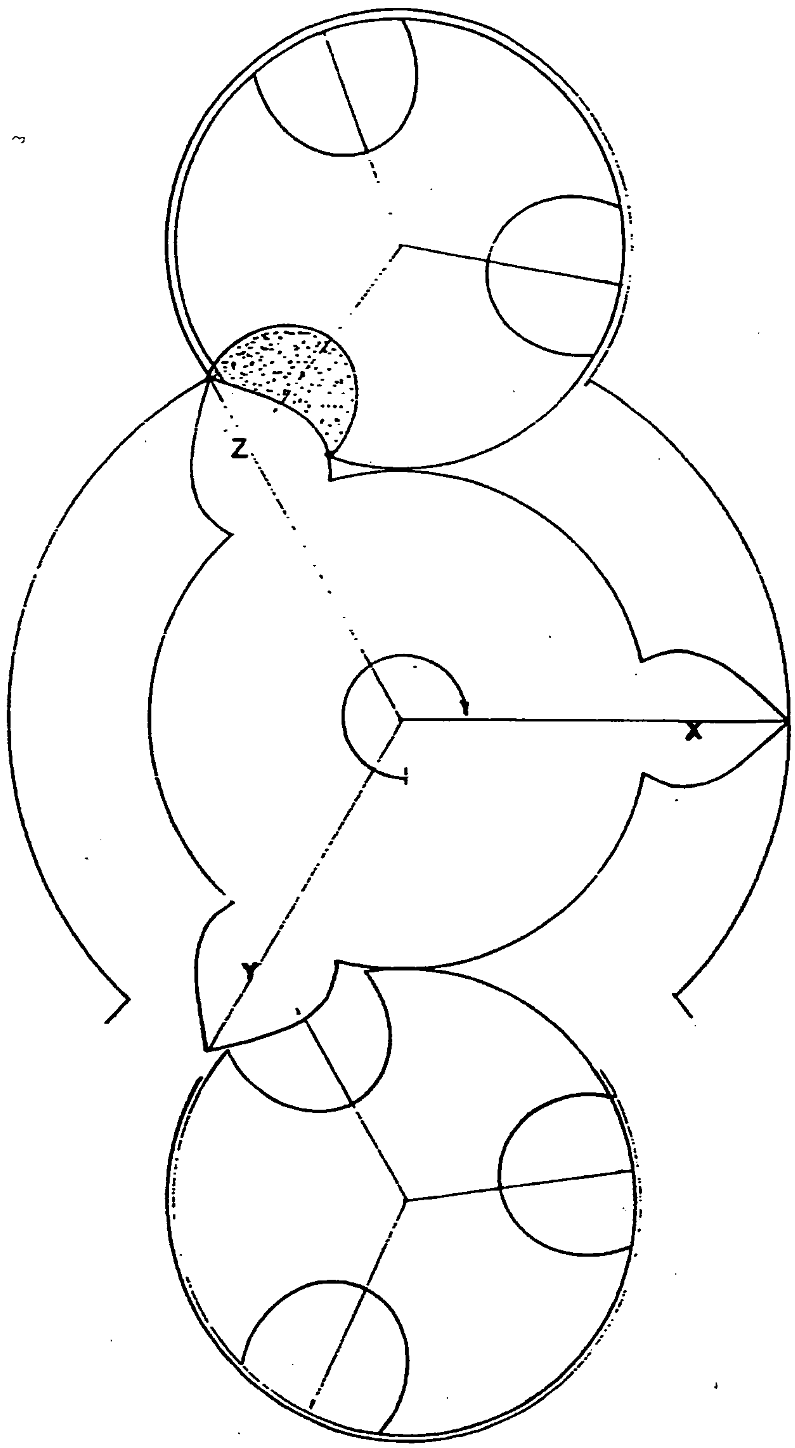

FIG. 6c

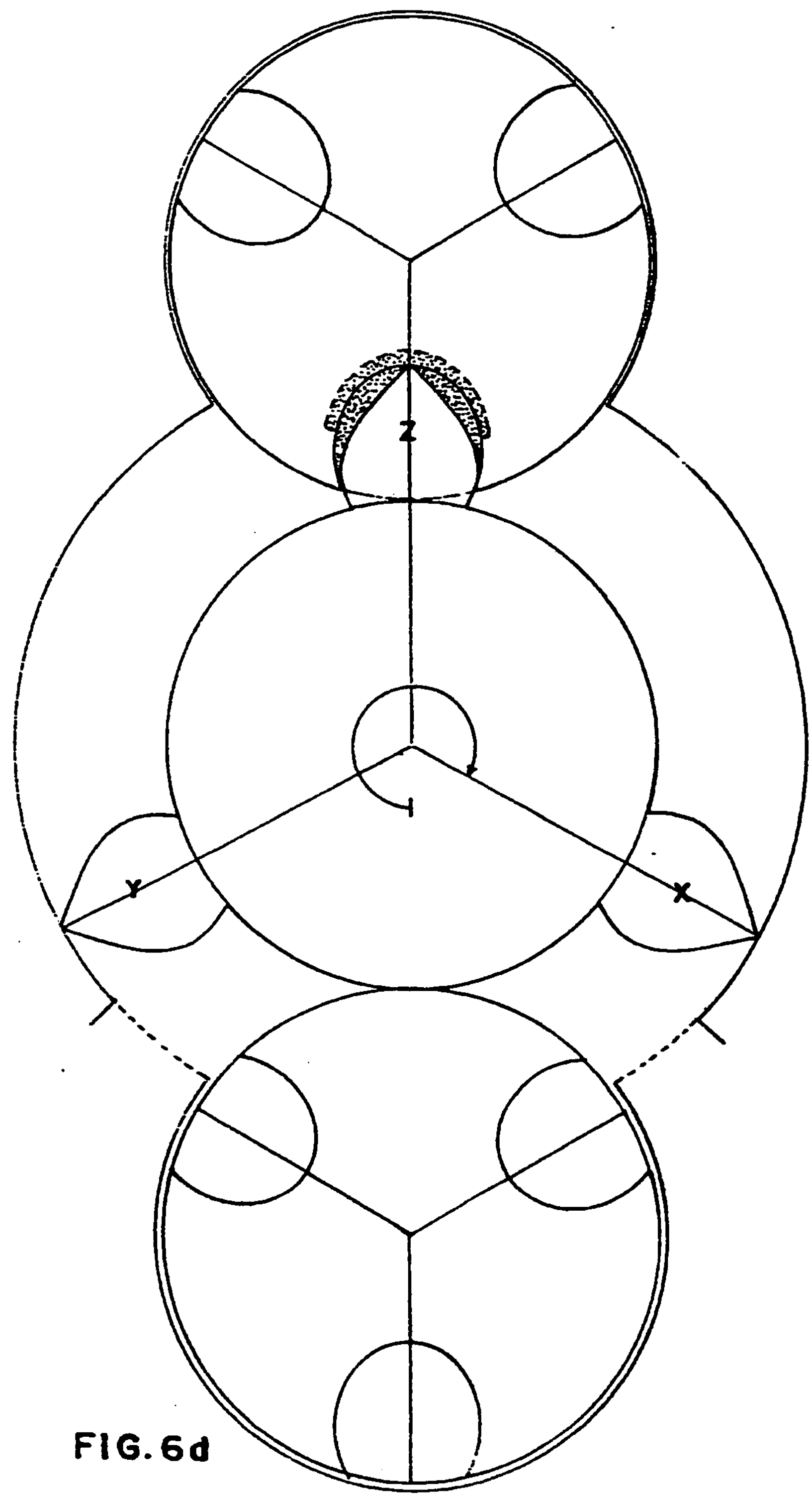

FIG.6d

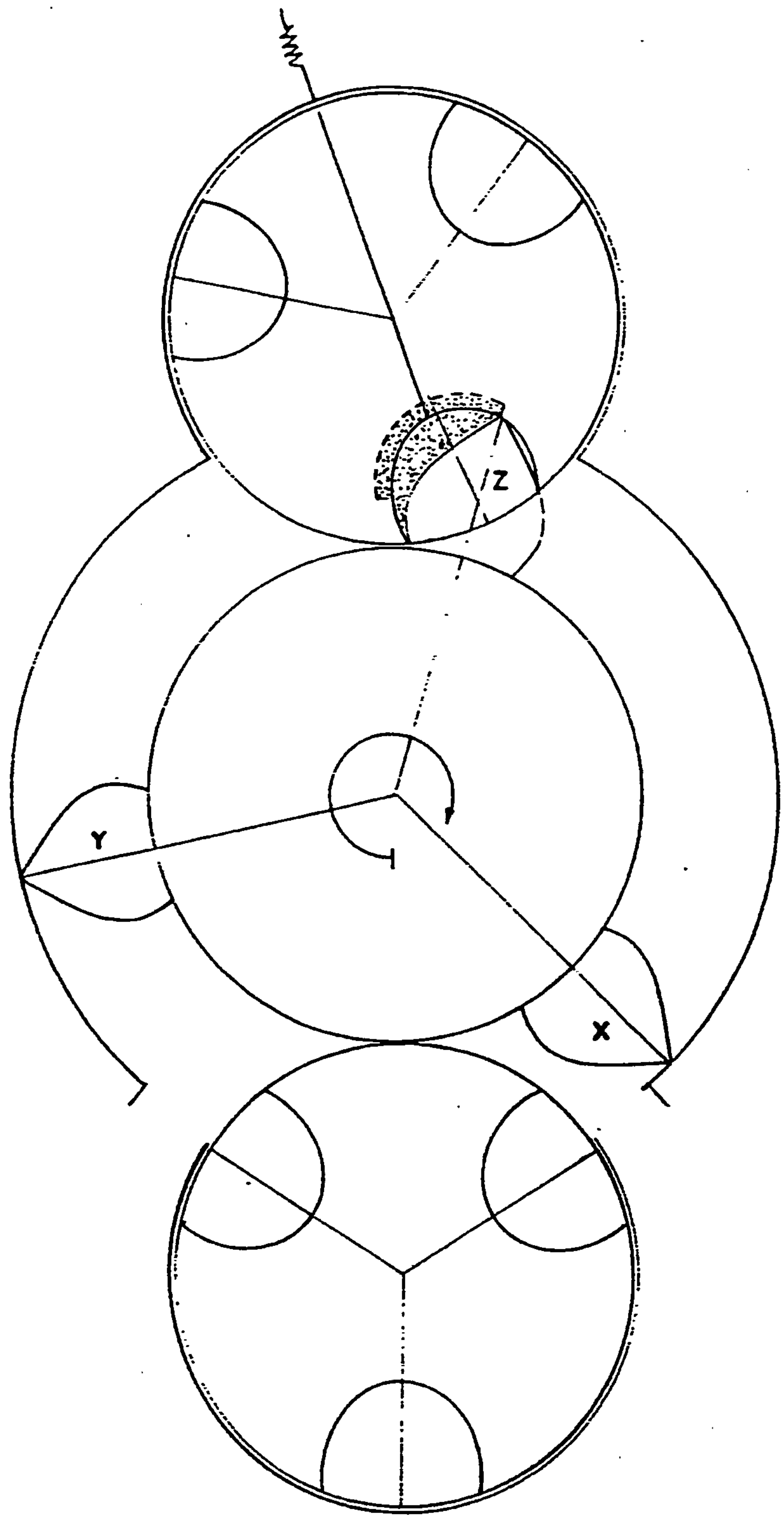

FIG. 6e

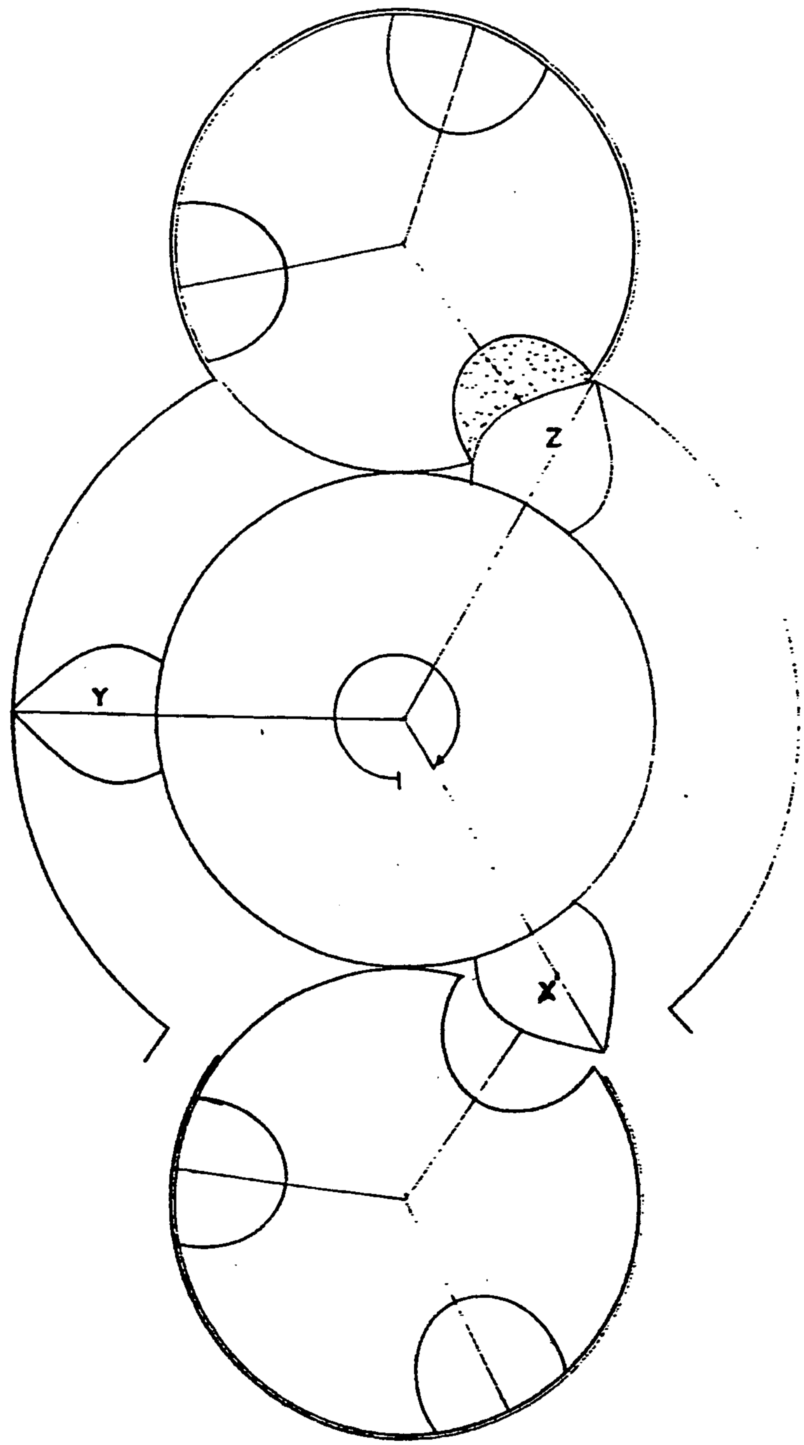

FIG. 6f

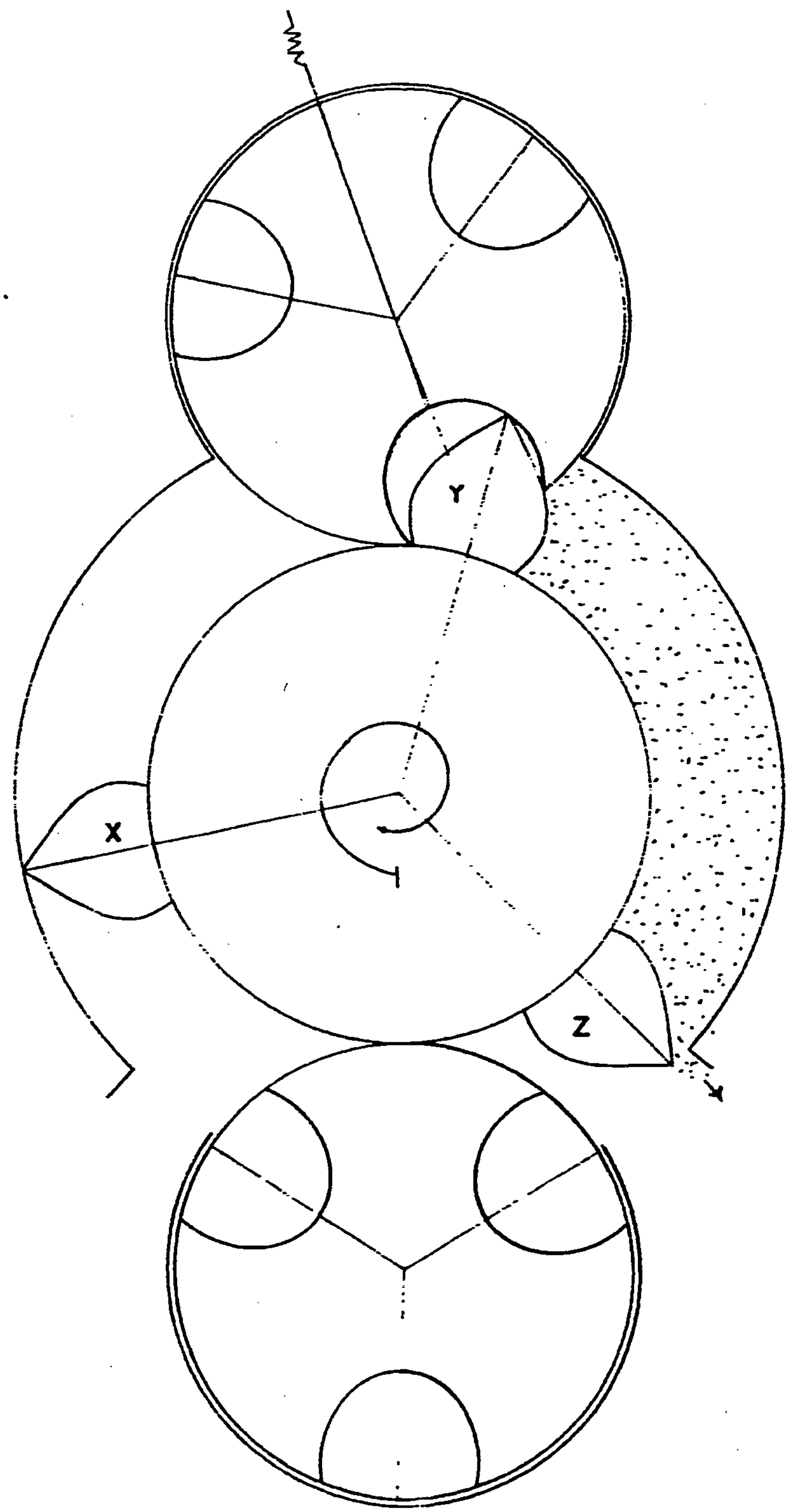

FIG. 6g

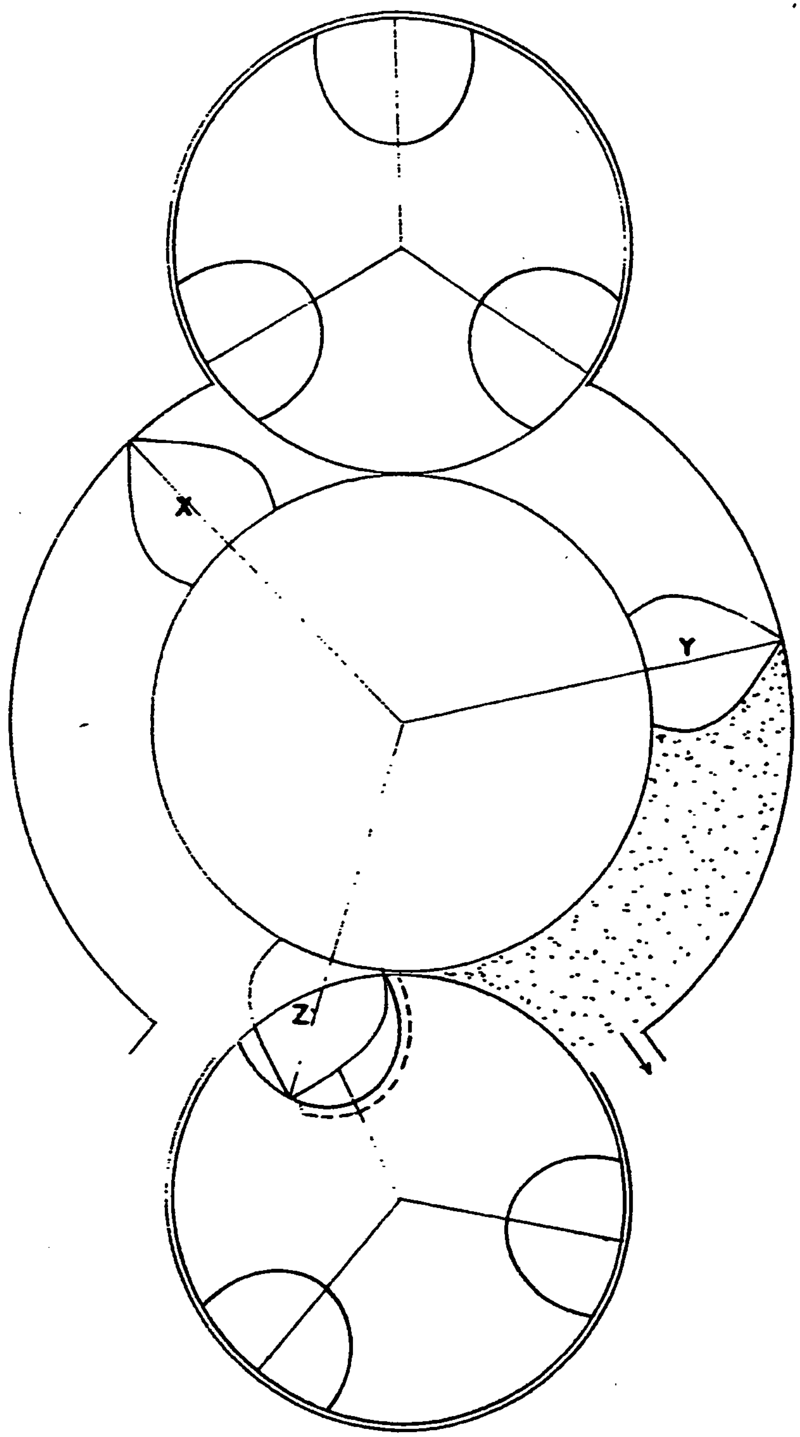

FIG.6h

INTERNATIONAL SEARCH REPORT

International Application No PCT/BR 90/00008

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC^5: F 02 B 53/00, F 01 C 1/20

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
Int. Cl.^{5}	F 02 B 53/00, F 01 C 1/00

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X A	DE, A, 1 526 371 (THE CLAYG CORP.) 29 January 1970 (29.01.70), see totality.	(1) (2,3)
X	DE, A, 1 810 346 (REINECKE) 11 June 1970 (11.06.70), see fig. 1.	(1)
A	GB, A, 397 352 (CARRE) 24 August 1933 (24.08.33), see totality.	(1,2)
A	DE, A, 1 576 897 (BOPP) 18 June 1970 (18.06.70), see fig. A-F.	(1)

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"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
08 October 1990 (08.10.90)	17 October 1990 (17.10.90)
International Searching Authority	**Signature of Authorized Officer**
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Anhang zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

Annex to the International Search Report on International Patent Application No. PCT/BR 90/00008

Annexe au rapport de recherche internationale relatif à la demande de brevet international n°.

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Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
DE-A - 1526371	29-01-70	SE-B - 332317 DE-B2- 1526371 DE-C3- 1526371	01-02-71 22-02-73 06-09-73
DE-A - 1810346	11-06-70	None	
GB-A - 397352		None	
DE-A - 1576897	18-06-70	None	

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DOCUMENT-IDENTIFIER: WO 9102888 A1

TITLE: ROTATING INTERNAL COMBUSTION ENGINE

PUBN-DATE: March 7, 1991

INVENTOR-INFORMATION:

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APPL-DATE: August 16, 1990

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INT-CL (IPC): F01C001/20, F02B053/00

EUR-CL (EPC): F01C001/20

US-CL-CURRENT: 123/232, **418/196**

ABSTRACT:

CHG DATE=19990617 STATUS=O>Rotating internal combustion engine which comprises three rotors (A, B, C), a central rotor (C) and another two (A, B), one on each side, the central rotor is cylindrical, containing on its periphery teeth (2) which fit in the respective cavities (1) provided on the surface of the rotors at each end in order to permit that the two points of the cavity (1') close to the periphery of the side rotors keep permanent contact with the surface of the respective tooth (2) in order to define its geometry.